Supersedes Suppl. Spec. dated 1/13/99 & 4/6/99

S U P P L E M E N T A L S P E C I F I C A T I O N

AMENDMENT TO SECTION 606 -- GUARDRAIL

Item 606.1451 - Beam Guardrail Terminal Unit Type (MELT)
Item 606.1452 - Beam Guardrail (Terminal Unit Type ELT)
Item 606.147 - Beam Guardrail (Terminal Unit Type G-2)
Item 606.1495 - Beam Guardrail (Terminal Section Type E-1)
Item 606.401 - Concrete Barrier, Single-Faced
Item 606.402 - Concrete Barrier, Double-Faced
Item 606.4029 - Modified Concrete Median Barrier
Item 606.411 - Concrete Barrier, Single-Faced, Precast
Item 606.412 - Concrete Barrier, Double-Faced, Precast
Item 606.4129 - Modified Concrete Median Barrier, Precast
Item 606.421 - Concrete Barrier, Single-Faced, Cast-in-Place
Item 606.422 - Concrete Barrier, Double-Faced, Cast-in-Place
Item 606.4229 - Modified Concrete Median Barrier, Cast-in-Place

Add to 2.2:

2.2.3 All wood posts and rails shall be treated after sawing and drilling or retreated after drilling in accordance with AASHTO M 133.

Amend 2.4.1 to read:

2.4.1 Galvanized steel rail elements, terminal sections, bolts, nuts, and other fittings shall conform to AASHTO M 180, (except that paragraph 11, Marking, shall not apply), Type II, Class A. Galvanized steel rail elements and terminal sections shall be treated with a solution of sodium dichromate or other approved chemical solutions so as to prevent or reduce storage stain. Corrosion resistant steel shall conform to AASHTO M 180, Type IV, Class A.

Add to 2.4:

2.4.1.1 Miscellaneous steel hardware without bracketed designation shall conform to ASTM A 36 and A 500 as appropriate. Hardware shall be galvanized, after all fabrication, in accordance with AASHTO M 232.

Add to 2.6.1:

Concrete used in extrusion or slip form barrier shall be of such consistency that after extrusion, it shall maintain the shape of the barrier without support.

2.6.1.1 Corrosion inhibitor admixture shall conform to AASHTO M 194 (ASTM C 494) Type C and be on the Approved Products List.

Add to 2.6:

2.6.5 Preformed Expansion Joint Filler shall conform to AASHTO M 153, Type III or AASHTO M 213.

2.6.6 Water repellent coating on concrete barrier, except portable concrete barrier for traffic control, shall be Silane-Siloxane conforming to 534.2.2.

Add to Materials:

2.9 Retroreflective sheeting shall conform to ASTM D 4956.

2.10 Water repellant for concrete barrier shall conform to 534.2.2.

Add to 3.1:

3.1.4 The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

Add to 3.1.1:

3.1.1.1 Breakaway wood posts B shall be set in augered or hand dug holes and backfilled in accordance with 3.1.3.

Add to 3.3:

3.3.1 Terminal units or sections shall be installed as shown on the plans, specified by the manufacturer or ordered.

3.3.2 Type III retroreflective sheeting 300 mm (12 in) high x 900 mm (36 in) wide shall be applied to the approach nose after fabrication and assembly but prior to the installation of bolts, if terminal units are installed 1.8 meters (6 feet) or less from the edge of pavement as follows:

One-Way Roadways:	Solid white on the right side of the road and solid yellow on the left side.
Two-Way Roadways:	Solid white on the right side of the road and no sheeting on the left side.

3.3.2.1 Retroreflective sheeting shall be attached to the 600 mm (24 in) corrugated steel pipe on the ELT terminal unit 100 mm (4 in.) down from the top by applying the retroreflective sheeting to 2 mm (0.080 in) thick, 300 x 900 mm (12 in x 36 in) aluminum sheet which shall be attached with six M6 - 1.25 x 25 mm (1/4 in - 20 x 1 in) bolts with washers fastened on the top and bottom at the ends and middle.

Amend 3.6 to read:

3.6 Temporary beam guardrail. Temporary beam guardrail shall be installed meeting the requirements of Item 606.120 (steel posts) or Item 606.140 (wood posts) except that approved used material may be installed.

Amend 3.7.1.1 to read:

3.7.1.1 Concrete barriers shall be supplied as precast units or constructed cast-in-place as specified to the configuration and details shown on the plans. Portable concrete barrier for traffic control shall be precast units. Minor deviations in the shape shall be submitted to the Engineer for approval.

Add to 3.7.1.1:

3.7.1.1.1 Concrete barrier shall conform to the following tolerances:

A. Cross-sectional dimensions shall not vary from the dimensions shown by more than 6 mm (1/4 in) and shall not be out of plumb by more than 6 mm (1/4 in), except the base which shall not vary by more than 13 mm (1/2 in).

B. Longitudinal dimensions shall not vary from the dimensions specified by more than 6 mm (1/4 in) per 3.0 m (10 ft).

C. Surface straightness irregularities when checked with a 3.0 m (10 ft) straight edge shall not exceed 6 mm (1/4 in).

D. Bar Reinforcement cover shall not vary from the dimensions specified by more than 13 mm (1/2 in).

Amend to 3.7.1.3 to read:

3.7.1.3 The layout and placement of the concrete barriers shall be to the alignment and elevations shown on the plans or as directed. Before any concrete or precast barrier may be placed, the subbase course shall be compacted to 95% density in accordance with the applicable tests as specified in 304.3.5 and fine graded to a tolerance of ± 13 mm (1/2 in) of the true grade at any location under the barrier. Whenever possible, as determined by the Engineer, concrete placing operations shall not begin until the subbase course has been fine graded ahead at least 300 m (1,000 ft).

Amend to 3.7.1.5 to read:

3.7.1.5 Concrete shall contain corrosion inhibitor (calcium nitrate) admixture added at the rate of 20 liters per cubic meter (4 gallons per cubic yard).

Add to 3.7.1:

3.7.1.8 Concrete Class B in accordance with 520 may be substituted for aggregate base course and hot bituminous base courses in the patch on the roadway side of concrete barrier. Concrete thickness shall be not less than that of the adjacent pavement.

3.7.1.9 Concrete barrier, except portable concrete barrier for traffic control, shall receive a Class 1, Ordinary Finish in accordance with 520.3.12.

3.7.1.10 Water repellent (silane-siloxane) shall be applied to concrete barrier, except portable concrete barrier for traffic control, in accordance with 534.3.

3.7.1.11 Defects are divided into two categories, minor defects and major defects. Minor defects in the barrier may be repaired in the field. Major defects shall be cause for rejection of the section, or the section shall be repaired in the manner directed by the Engineer.

3.7.1.11.1 Minor defects are defined as holes, honeycombing or spalls which are 150 mm (6 in) or less, in diameter, and which do not expose the outermost surface of the steel reinforcement. Surface voids 10 mm (3/8 in), or less, in diameter and 10 mm (3/8 in), or less, in depth are not considered defects and they do not require repair.

3.7.1.11.2 Major defects are defined as, any defect which does not meet the definition of a minor defect or minor defects which, in aggregate, comprise more than two percent of the surface area of the barrier section.

3.7.1.12 Repair of hardened concrete shall be as follows:

A. Minor Defect Repair. Repair shall be made with a Fast Set Nonshrink Patching Mortar appearing on the Approved Products List. Methods of repair shall be acceptable to the Engineer. The color of the repaired portion shall match as nearly as practicable, the color of the surrounding concrete. Repaired portions shall exactly match shape requirements.

B. Major Defect Repair. Major defect repair methods shall be preapproved by the Engineer.

Amend 3.7.2 to read:

3.7.2 Cast-in-Place Barriers. Cast-in-place barriers shall be constructed by either the "fixed forms" or "extrusion or slip form" method or a combination, at the Contractor's option.

3.7.2.1 General.

3.7.2.1.1 Contraction joints shall be formed or saw cut normal to the pavement. The spacing shall be every 6 m (20 ft), as shown on the plans or as ordered by the Engineer. The joints shall conform to the dimensions as shown on the plans or standard sheets. If the joints are saw cut, they shall be saw cut so no damage to the concrete will result, within a maximum time of 8 hours. If sawing or forming joints is performed before the concrete has hardened, the

adjacent portions of the barrier shall be supported firmly with close fitting shields. The liquid curing compound, if used, shall be reapplied at the saw cut.

3.7.2.1.2 Expansion joints shall be formed normal to the pavement with Preformed Expansion Joint Filler and shall provide for expansion of 13 mm (1/2 in). The filler material shall be cut to conform to the cross section of the barrier.

3.7.2.1.2.1 The expansion joints shall be located at all immovable objects (bridge substructures, etc.), where shown on the plans, and/or as directed by the Engineer. Expansion joints shall not be required at regular intervals unless shown on the plans.

3.7.2.2 Fixed Forms Barrier.

3.7.2.2.1 Forms and subgrade shall be thoroughly moistened in conformance to 520.3. Care shall be taken that form construction has been completed, embedment of required materials placed and removal of all foreign materials completed before the concrete is placed.

3.7.2.2.2 Concrete shall be placed in its final position. Excessive movement of concrete by use of vibrators will not be permitted.

3.7.2.2.3 Concrete shall not be dropped a distance of more than 1.5 m (5 ft) unless contained within a tremie, elephant trunk or other approved system.

3.7.2.2.4 Concrete shall be consolidated as provided in 520.3.5.4 by means of high frequency internal vibrators within 15 minutes after it is deposited in the forms. Vibrators shall not be attached to, or held against the forms or the reinforcing steel. Care shall be taken to avoid the displacement of reinforcement.

3.7.2.2.5 In the event of an emergency where placement continuity is affected, the Engineer will decide if a construction joint will be allowed and will direct the Contractor as to the location and manner in which the joint is to be constructed.

3.7.2.2.6 Concrete shall be cured in compliance with 520.3.10.1. Forms shall not be removed for a period of 3 days or as directed.

3.7.2.3 Extrusion or Slip Form Barrier.

3.7.2.3.1 The extrusion or slipforming equipment shall be self-propelled and shall be capable of placing, consolidating and finishing concrete to the proper line and grade. Extrusion or slip form equipment shall include internal vibrating capability. The Engineer may require the Contractor to demonstrate that the specific equipment proposed for use is capable of satisfactorily placing the concrete mix or furnish evidence of successful operation of the equipment. The Contractor shall furnish the manufacturer’s data regarding machine operation to the Engineer.

3.7.2.3.2 The slipforming equipment shall have as nearly a continuous forward movement as possible to provide uniform progress with stopping and starting of the equipment held to a minimum under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete. Concrete shall be supplied and fed into the extrusion or slip form machine at a uniform rate to produce a continuous, completely shaped barrier. Any edge slump resulting from slipforming operations in excess of 6 mm (1/4 in), as measured from the top surface of the median barrier, exclusive of edge rounding, shall be corrected before the concrete has hardened. If during the operation of the slip-form equipment a tear occurs, it shall be repaired immediately or removed and replaced as directed by the Engineer.

3.7.2.3.3 The grade for the top of the concrete barrier shall be indicated by an offset guide line set by the Contractor. The forming portion of the extrusion or slip form machine shall be readily adjustable vertically during the forward motion of the machine to conform to the predetermined grade line. A grade line gage or pointer shall be attached to the machine in such a manner that a continual comparison can be made between the barrier being placed and the established grade line as indicated by the offset guide line.

3.7.2.3.3.1 Instead of the above method for maintaining the barrier grade, the extrusion or slip form machine may be operated on rails or forms set at uniform depth below the predetermined finished top of the barrier grade, or on existing pavement or bridge decks.

3.7.2.3.4 Barriers having surface irregularities greater than 10 mm (3/8 inch) in 3 m (10 ft.) shall be corrected immediately at the Contractor's expense. Continued variations in the barrier surface exceeding 6 mm (1/4 in) in 3 m (10 ft.) will not be permitted and remedial action shall immediately be taken to correct the problem. Any deformations or bulges remaining after the initial set shall be removed by grinding after the concrete has hardened. The vertical surface at the base of the barrier shall be trowelled true after passage of the slip form machine. All holes and honeycomb shall be patched immediately. The entire surface shall receive a light brush (broomed) finish before final set.

3.7.2.3.5 If concrete placement is terminated for any reason or interrupted for a period of time where the delay will affect the quality and structural integrity of the barrier, the Contractor shall terminate operations by one of the following procedures.

A. Construct a cast in place expansion joint system as detailed on the standard sheets.

B. Remove existing unset concrete to a vertical score line with hand tools. The vertical surface resulting from the removed concrete shall remain reasonably rough and unfinished to facilitate interlock and increased bond area when concrete operations are to be resumed. the vertical surface shall be touched up with hand tools to correct unacceptable voids, tears and lack of consolidation resulting from the concrete removal. The surface shall be covered with several layers of wet burlap to prevent drying. All reinforcing steel shall extend beyond the face to provide adequate lapping.

3.7.2.3.6 Concreting operations may resume at the terminated face when the terminated portion has achieved enough rigidity to withstand the sequence of operations it will be subjected to without sustaining damage. All loose or unacceptable concrete and material shall be removed from the terminated face as directed by the Engineer. Immediately prior to placing fresh concrete against a terminated face, the damp surface shall be completely coated with a Bonding Agent appearing on the Approved Products List. Concrete barrier damaged as a result of the Contractor's operations shall be repaired to the satisfaction of the Engineer.

3.7.2.3.7 The concrete barrier shall be cured in compliance with 520.3.10.1 method "a" or method "b" using a liquid curing compound recommended by the manufacturer of the water repellent (silane-siloxane) used on the barrier and contained on the Department's Approved Products List. The curing compound, if used, shall be sprayed on the concrete surface immediately following the placing operation at a rate of 2 liters per 10 square meters (1 gallon per 200 square feet). When sawing or forming joints is performed after the application of curing compound, the exposed faces of the barrier in the vicinity of the joint shall be treated with curing compound after sawing or forming the joints.

Amend 3.7.4 to read:

3.7.4 Portable concrete barrier for traffic control. Portable concrete barrier for traffic control may be approved used barrier. Portable concrete barrier for traffic control shall include relocating the barriers on the project as well as transporting the barriers to and from the project.

Amend 4.1.1 to read:

4.1.1 Corrugated beam guardrail indicated as "standard section" and Terminal Section Type E-1 will be measured by the linear meter (linear foot) as shown on the plans. Terminal units will each be measured by the unit.

Amend 4.5 to read:

4.5 Delineators will be measured in accordance with 621.4. Delineators required for temporary guardrail and portable concrete barrier for traffic control will not be measured.

Add to 5.3:

5.3.3 Hot bituminous base courses placed adjacent to the concrete barrier for a maximum width of 300 mm (1 ft) will be paid for under 403.12. Concrete Class B substituted for aggregate base course and hot bituminous base courses will be paid for under 403.12 at 2.0 metric tons (tons) per cubic meter (cubic yard).

Amend 5.5 to read:

5.5 Delineators will be paid for in accordance with 621.5, except delineators required for temporary guardrail and portable concrete barrier for traffic control will be subsidiary.

Add to Pay Item and Units:

606.1451	Beam Guardrail Terminal Unit Type (MELT)	Unit
606.1452	Beam Guardrail (Terminal Unit Type ELT)	Unit
606.147	Beam Guardrail (Terminal Unit Type G-2)	Unit
606.1495	Beam Guardrail (Terminal Section Type E-1)	Linear Meter (Linear Foot)
606.401	Concrete Barrier, Single-Faced	Linear Meter (Linear Foot)
606.402	Concrete Barrier, Double-Faced	Linear Meter (Linear Foot)
606.4029	Modified Concrete Median Barrier	Linear Meter (Linear Foot)
606.421	Concrete Barrier, Single-Faced, Cast-in-Place	Linear Meter (Linear Foot)
606.422	Concrete Barrier, Double-Faced, Cast-in-Place	Linear Meter (Linear Foot)
606.4229	Modified Concrete Median Barrier, Cast-in-Place	Linear Meter (Linear Foot)

Amend Item 606.41291 to read 606.4129.